8. Notes on the Myology of the *Phrynosoma coronatum*. By Alfred Sanders, M.R.C.S., F.Z.S., Lecturer on Comparative Anatomy at the London Hospital Medical College.

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From several specimens of lizards, for which I was indebted to the courtesy of Mr. Garrod, I selected the subject of the present memoir, thinking, and as the event proved, correctly, that the singularity of its external form might be correlated with equal singularities in its muscular arrangements. According to Duméril and Bibron * the genus *Phrynosoma* comprises three species. Of these, a figure of one, *P. harlanii*, is given in Cuvier's Animal Kingdom by Griffiths, under the name of *Agama cornuta*, and of another by Wiegmann†, *P. orbiculare*; but neither of these figures corresponds exactly with my specimen, differing as they do in slight details; but the description of the third species, *P. coronatum*, agrees better than either, and it is therefore this name which is adopted in the following pages.

This animal, as well as *Liolepis belli*, a memoir on the myology of which I had the honour of presenting to the Zoological Society last year ‡, belongs to the family of the Iguanas. As will be seen, the arrangement of its muscles differs considerably from that of *Iguana tuberculata*, an exhaustive treatise on which was read by Mr. Mivart in 1867§.

Platysma myoides (fig. 1, *P.M.*). This muscle resembles the one which occurred in *Liolepis belli*. Its anterior fibres run transversely from one ramus of the mandible to the other superficially, being inserted into the inner edge for the whole length, with the exception of a small portion anteriorly; the posterior fibres are inserted into the connective tissue at the side of the neck. At the outer edge of the muscle a few fibres are separated from the remainder by a small interspace; but in the mid line they are all continuous; the posterior border is situated slightly in front of the anterior edge of the muscles of the shoulder. This muscle appears to correspond to the thin plane of muscular fibre marked by Mr. Mivart in the memoir above referred to as mylo-hyoid in front, and platysma myoides behind; but in the present subject it is one continuous muscle. That it is not the mylo-hyoid is plain; for it has no attachment to the hyoid bone; moreover the true mylo-hyoid, which is absent in *Phrynosoma*, is to be found in *Liolepis belli*, which also possesses the homologue of this platysma. If the above interpretation be correct, on the removal of this muscle we immediately come to the

Genio-hyoglossus (fig. 1, *G.H.*), which arises from the distal extremity of the thyro-hyal and its second segment for about half its length; the superficial fibres pass forward and are inserted into

* Erpétologie Générale, tom. iv. p. 314.
† Herpetologia Mexicana, tab. viii. fig. 1.
‡ P. Z. S. 1872, p. 154. § *Ibid.* 1867, p. 766.

the symphysis of the mandible, while the deeper fibres are inserted into the outer edge of the tongue. The part of this organ to which these fibres are attached is separated from the central portion by a deep furrow; this is the case on each side, so that this animal appears to have three tongues—a central one broad, fleshy and blunt, which is flanked by a pair, smaller and pointed.

Hyoglossus (fig. 1, *H.G.*), slightly overlapped by the last, arises from the distal extremity of the thyro-hyal; the fibres pass obliquely forward and inward, and partly join those of its fellow of the opposite side by means of a raphe; some of the other fibres are inserted into the glosso-hyal, while the remainder pass into the lower side of the central part of the tongue, in the substance of which they pass forward to its anterior extremity. The two preceding muscles do not appear to be represented in the *Iguana**.

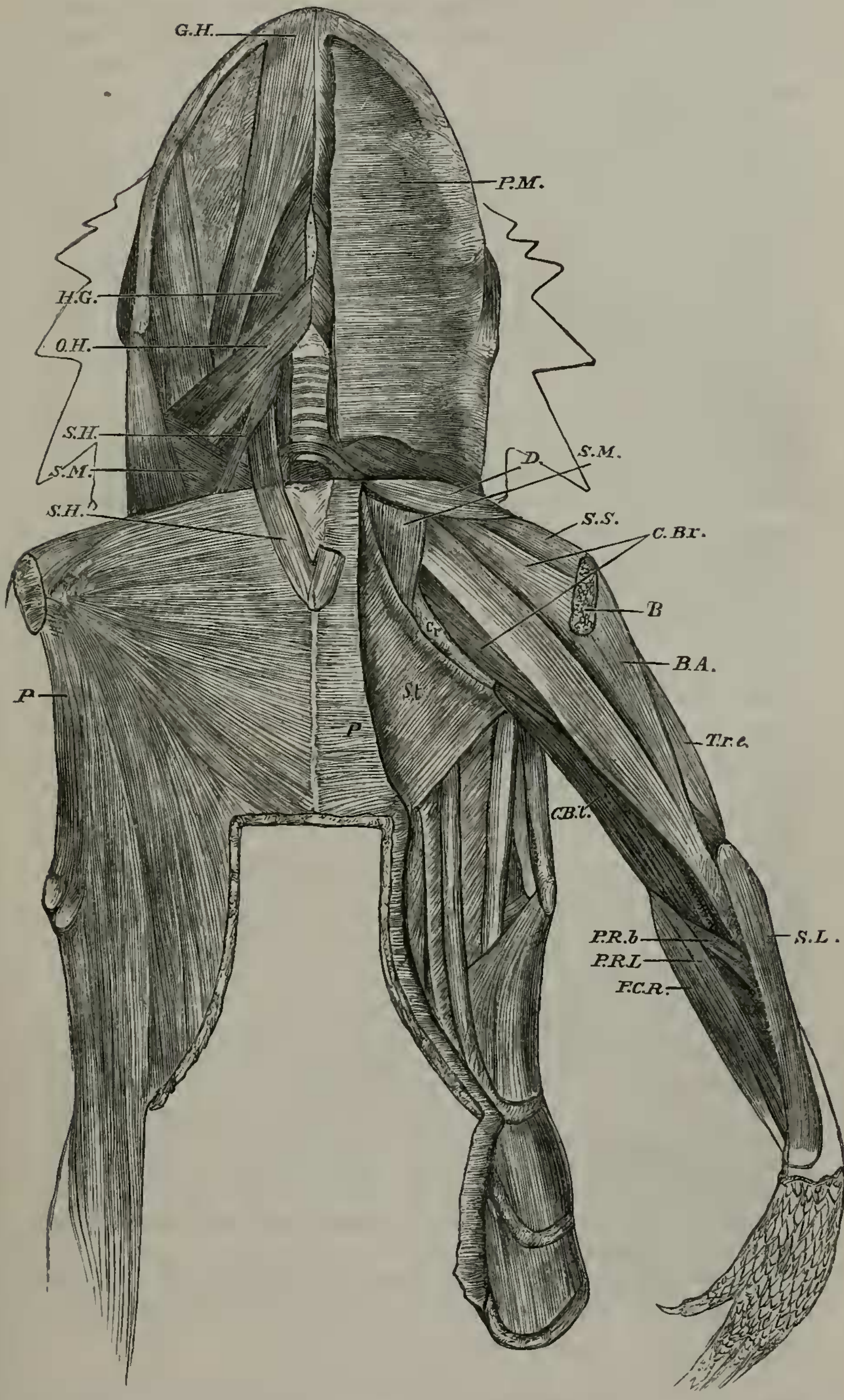
Cerato-hyoid arises from the whole length of the thyro-hyal and the segments which together form the posterior cornu of the os hyoides; the internal and deeper fibres are inserted into the proximal end of the anterior cornu (cerato-hyal) for two thirds of its length; the external and more superficial fibres pass on to be inserted into the side of the mandible in front and dorsad of the insertion of the neuro-mandibularis, extending forward for nearly half its length; an additional bundle of fibres arises from the extreme distal end of the cerato-hyal to join the last-mentioned fasciculus. Whether this corresponds to the cerato-mandibular I am not sure from the memoir on *Iguana*; but on referring to the description of the myology of *Chamæleon parsonii* by the same author†, I find that it does not exactly agree with any of the muscles of the throat in either of those species.

Omo-hyoid (figs. 1, 2, & 3, *O.H.*) arises from the inner surface of the scapula, from a line going obliquely from the anterior to the posterior edge; and passing forward and ventrad, its superficial fibres are inserted into the posterior edge of the basihyal, while the deeper fibres spread out and are attached to about two thirds of the distal end of the thyro-hyal and the proximal end of its second segment; the muscles of the two sides meet in a point at the middle line.

There are two sterno-hyoids, as in *L. belli*. The one, very narrow, arises from the sternum ventrad of the sterno-mastoid, and, passing forward in front of the sterno-hyoideus profundus, is inserted into the dorsal surface of the thyro-hyal close to its articulation with the basihyal. The other, which appears to correspond to the sterno-hyoideus profundus in *L. belli*, although in its origin it is more superficial than the former, arises from a space on the ventral surface of the sternum left vacant by the pectorales majores, extending for about one third its length from the anterior edge of that bone. The muscles of both sides meet in a point posteriorly in the mid line; anteriorly each spreads out into a broad and thin expansion, which is inserted into the external half of the thyro-hyal. The single sterno-hyoid of *P. japonicus* ‡ appears to correspond to the latter of the two preceding muscles.

* *Loc. cit.* † P. Z. S. 1870, p. 850. ‡ *Ibid.* 1870, p. 414.

Fig. 1.



Superficial muscles on the ventral aspect of the anterior half of the body. × 3.

Sterno-mastoid (figs. 1 & 3, *S.M.*) arises from the anterior end of the articular surface between the sternum and the clavicle, and from the extremity of the cross piece of the interclavicle; it passes forward and dorsad to be inserted into the posterior surface of the cranium, between the origins of the digastric and the complexus.

Neuro-mandibularis (fig. 3, *N.*) in this species runs obliquely downward and forward, instead of directly downward as in *L. belli* and *P. japonicum*. It arises from the outer edge of the complexus, as in those lizards, and from the fascia of the back at the level of the scapula, and is inserted into the posterior point of the mandible. This muscle does not appear to be represented in *Iguana**.

Ectopterygoid is very small, and only corresponds to the internal part of the same muscle in *L. belli* and *P. japonicum*; it is covered by the muscles of the hyoid arch, and arises from the external edge of the pterygoid, and is inserted into the inner surface of the angle of the mandible.

Temporalis is a much less extensive muscle than in either *P. japonicum* or *L. belli*. It is triangular, and arises from what appears to be the squamosal and postfrontal, anterior to the quadrate; it is inserted into the upper surface of the mandible, in front of the articulation of that bone with the quadrate.

Entopterygoid (fig. 3, *En.P.*) is the principal muscle for moving the lower jaw. It arises from the posterior apophysis of the parietal, from the squamosal, and also from the anterior side of the quadrate, and is inserted into the upper edge of the mandible for about one third of its length, in front of the articulation with the quadrate. A muscle which I interpret as being homologous with the tensor tympani does not appear to be present in *Iguana*; it arises from the columella, and from the anterior and upper point of the prootic, covered by both pterygoids, and is inserted into the pterygoid bone; it was found in both *P. japonicus* and *L. belli* as well as in the present subject.

Digastric (fig. 3, *Di.*) arises from the point where the squamosal and exoccipital meet, and descends to be inserted into the posterior end of the mandible immediately above the insertion of the neuro-mandibularis. This appears to represent the posterior part of the digastric of the human subject.

The dorsal muscles appear to follow the usual arrangement. The sacro-lumbalis commences in the tail, and is partly inserted into the ilium, from which bone it takes a fresh origin. The longissimus dorsi is not distinguishable from the spinalis dorsi; they both commence in the caudal region. The complexus resembles that of *L. belli*; neither a trachelo-mastoid nor a transversalis colli could be found. A small muscle arises from the transverse process of the axis above the insertion of the levator scapulæ, and is inserted into the basi-occipital; this differs from the rectus posticus of *L. belli*, and perhaps represents a rectus lateralis.

Rectus anticus major resembles the same muscle in *L. belli*, but in addition arises from the four cervical and three anterior dorsal ribs.

* P. Z. S. 1867. p. 766.

Rectus abdominis has the same attachments as in *L. belli.* Its anterior portion is extremely thin, and is covered by a connective tissue loaded with pigment-cells, which tissue also covers over the sacro-lumbalis.

It is a singular fact that there is not the slightest trace of a trapezius in this lizard.

Latissimus dorsi (figs. 2 & 3, *L.D.*) has an extraordinary arrangement in this subject. It arises from the spines of the third and fourth dorsal vertebræ, as a narrow muscular band which passes straight across the back, over the posterior end of the scapula, until it reaches the second dorsal rib, from which it takes a fresh and more extensive origin; the external fibres of this part of the muscle arise more posteriorly, from the third, fourth, and fifth dorsal ribs. The whole passes forward and ends in a flat tendon, which is inserted as usual into the posterior surface of the humerus just behind the insertion of the teres minor. It sends off a tendinous slip to join the inner head of the triceps—an arrangement which occurs also in *Iguana*, according to Mr. Mivart*. That part of the muscle which is situated between the scapula and the vertebral column was so closely attached to the skin as to be with difficulty dissected from it.

Levator scapulæ (fig. 3, *L.S.*) arises from all that portion of the suprascapula which is not occupied by the infraspinatus, with the exception of a small portion situated at the junction of the dorsal with the posterior border; it passes forward to be inserted into the transverse process of the axis.

Sterno-coracoidalis resembles in every respect the corresponding muscle of *L. belli.*

Sterno-coracoidalis externus (fig. 2, *Sc.e.*) arises from the internal surface of the coracoid, close to its lower or articular edge, and a short distance from its anterior point, and passing backward is inserted into the outer angle of the sternum covered by the ligament of the triceps. There are three serrati (fig. 2, *S.A.* 1, *S.A.* 2, & *S.P.*) precisely resembling those of *L. belli.*

Supraspinatus (fig. 1, *S.S.*) arises from the anterior margin of, and from the membrane covering the coracoid fenestra, and is inserted into the anterior and outer point of the humerus in front of and nearer the head of the bone than the infraspinatus.

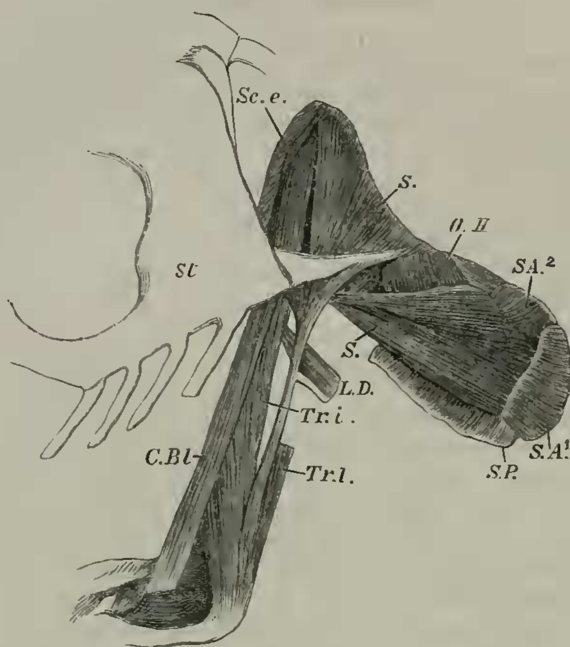
Infraspinatus (fig. 3, *I.S.*) arises from the central portion of the outer surface of the scapula and suprascapula, and from the anterior edge of that bone at the scapulo-clavicular articulation; it is inserted into the outer edge of the humerus, just beyond the insertion of the supraspinatus.

Teres minor (fig. 3, *Ts.M.*) arises from the inner edge of the scapula at its point of junction with the coracoid; it passes beneath the clavicle, and being, as usual, bound down by a tendon from the long head of the triceps, is inserted by muscular fibres into the humerus, commencing immediately within and just behind the anterior border of the insertion of the infraspinatus, and extending obliquely

* P. Z. S. 1867, pp. 768, 780.

backward and ventrad to the base of the tuberosity of the humerus, extending beyond the insertion of the last.

Fig. 2.



Muscles on the inner aspect of the arm. × 3.

The supraspinatus corresponds to the muscle named by Mr. Mivart epicoraco-humeral in *Iguana*, and subclavius in *Chamæleon parsonii*. The infraspinatus does not appear to be represented in *Iguana*, but might correspond to one of the suprascapulars in *Chamæleon*. Teres minor corresponds to infraspinatus in *Iguana*, but is not found in *Chamæleon*. In my two former papers I took the liberty of differing from Mr. Mivart in the interpretation of these three muscles, and explained my reasons for so doing; but perhaps it will save the trouble of referring to those memoirs, if I briefly recapitulate those reasons in the present place. First, as to the insertions, they are all inserted on the outer side of the humerus, or close to it, at a point which corresponds to the greater tuberosity; these insertions occur in the following order, viz. the supraspinatus nearest the head of the bone, the infraspinatus next, and the teres minor* furthest off—an arrangement which closely agrees with that found in the human subject. Next, with regard to the origins of these muscles: supraspinatus arises from the coracoid bone together

* In a lizard, however, which I have recently dissected, a species of the subgenus *Tropidolopisma*, this muscle ends in a tendon which winds round the humerus to be inserted close to the head of the bone, quite on the inner side, being covered by the internal head of the triceps.

with the epicoracoid and præcoracoid, which might well represent the supraspinous fossa; the infraspinatus arises from the surface of the scapula proper, which might be taken to represent the infraspinous fossa, while the teres minor arises from the edge of the bone; all these facts appear to me to point in the same direction. In a paper entitled "On the homologies of certain muscles connected with the shoulder-joint"*, Prof. Rolleston points out that the epicoraco-humeral [my supraspinatus] is homologous with the subclavius. In a memoir which was published in the same volume of the Transactions of the Linnean Society, "On the Myology of the *Orycteropus capensis*," Mr. Galton showed that the subclavius in that animal has, among other insertions, one into the fascia covering the supraspinatus; and, seeing that the nerve which in anthropotomy supplies the supraspinatus arises from the same cord of the brachial plexus as, and close to, the one which supplies the subclavius, we have a body of evidence to show that, although the ingenious line of argument adopted by Prof. Rolleston satisfactorily proves that the muscle in question represents the subclavius, yet it is quite possible that it is partly homologous with the supraspinatus also, viz. in its insertion.

Subscapularis (fig. 2, *S.*) arises in two portions—one from the whole of the inner surface of the coracoid (with the exception of a small part on the inner edge) and from a small portion of the scapula adjacent, the other from the surface of the scapula close to its junction with the suprascapula. These two sections join together at rather more than a right angle, and are inserted into the inner side of the head of the humerus and into the capsular ligament of the shoulder-joint.

Deltoid (figs. 1 & 3, *D.*) arises from the ventral half of the clavicle and from the interclavicle, and is inserted into the outer side of the humerus just beyond the head of that bone. This appears to represent the clavicular portion only of the muscle, and the part marked D1 by Mr. Mivart in *Iguana.*

Pectoralis major (fig. 1, *P.*) has the usual arrangement.

Biceps (fig. 1, *B*) arises, as usual, by a broad musculo-tendinous origin from about the anterior and inner third of the outer surface of the coracoid; it passes down the arm and is inserted by a broad tendon into the contiguous surfaces of both the radius and ulna in conjunction with the

Brachialis anticus (figs. 1 & 3, *B.A.*), which arises from the outer surface of the humerus for about two-thirds of its length, commencing just beyond and outside the insertion of the pectoralis major; its insertion joins that of the biceps.

Coraco-brachialis longus (figs. 1 & 2, *C.B. l.*) arises narrow and fleshy from the posterior point of the coracoid, and is inserted into about the distal third of the inner side of the humerus and into the ventral surface of the inner condyle.

Coraco-brachialis brevis (fig. 1, *C.Br.*), short and broad, arises from the whole surface of the coracoid ventrad of the coracoid

* Trans. Linn. Soc. vol. xxvi. pt. 3.

fenestra, and is inserted into the ventral surface of the humerus for about half its length, commencing at the head.

Triceps (figs. 1 & 3, *Tr. e.*) in this species has four origins. The outer head arises from the external surface of the humerus for nearly its whole length, commencing immediately within the insertion of the infraspinatus.

The long head (figs. 2 & 3, *Tr. l.*) arises from the posterior border of the scapula just above the glenoid cavity, and gives a tendon which passes across the teres minor in the usual manner to be inserted into the humerus close behind the anterior level of the insertion of the infraspinatus.

The inner head (fig. 2, *Tr. i.*) is divided into two distinct portions: one part arises by muscular fibres from nearly the whole length of the inner surface of the humerus; at about the junction of the distal with the middle third it joins the other portion, which arises by a narrow tendon from a ligamentous band, which goes from the external angle of the sternum to the inner surface of the scapula, dorsad of its point of junction with the coracoid; at the point of insertion the tendon spreads out into a broad expansion, one end of which is attached to the above-mentioned ligament, while the other end is connected to the posterior angle of the coracoid close to the origin of the coraco-brachialis longus. All four heads join together, and developing a sesamoid bone in the substance of their common tendon are inserted into the proximal end of the ulna. The arrangement of this muscle in this species is just opposite to that found in *P. japonicum*, in which lizard the outer head, and not the inner head, is the one which is divided into two parts*.

Extensor carpi ulnaris (fig. 3, *E.C.U.*) arises by two heads—one by a flat tendon from the outer condyle of the humerus, the other fleshy from the proximal end of the ulna; it is inserted by a narrow tendon into the base of the metacarpal bone of the fifth digit.

Supinator longus (figs. 1 & 3, *S.L.*) arises from the external condyle of the humerus, and is inserted into the whole length of the radius.

Extensor longus digitorum (fig. 3, *E.L.*) arises from the outer condyle close to the last; half of it goes to join that muscle at about the distal third of the radius; the remainder develops three short tendons, which are inserted into the base of the 2nd, 3rd, and 4th metacarpal bones; the tendon for the fourth digit is given off higher up than the other two.

Extensor ossis metacarpi pollicis (fig. 3, *E.M.*) seems very constant; in this species it is a triangular muscle precisely resembling that of *L. belli*.

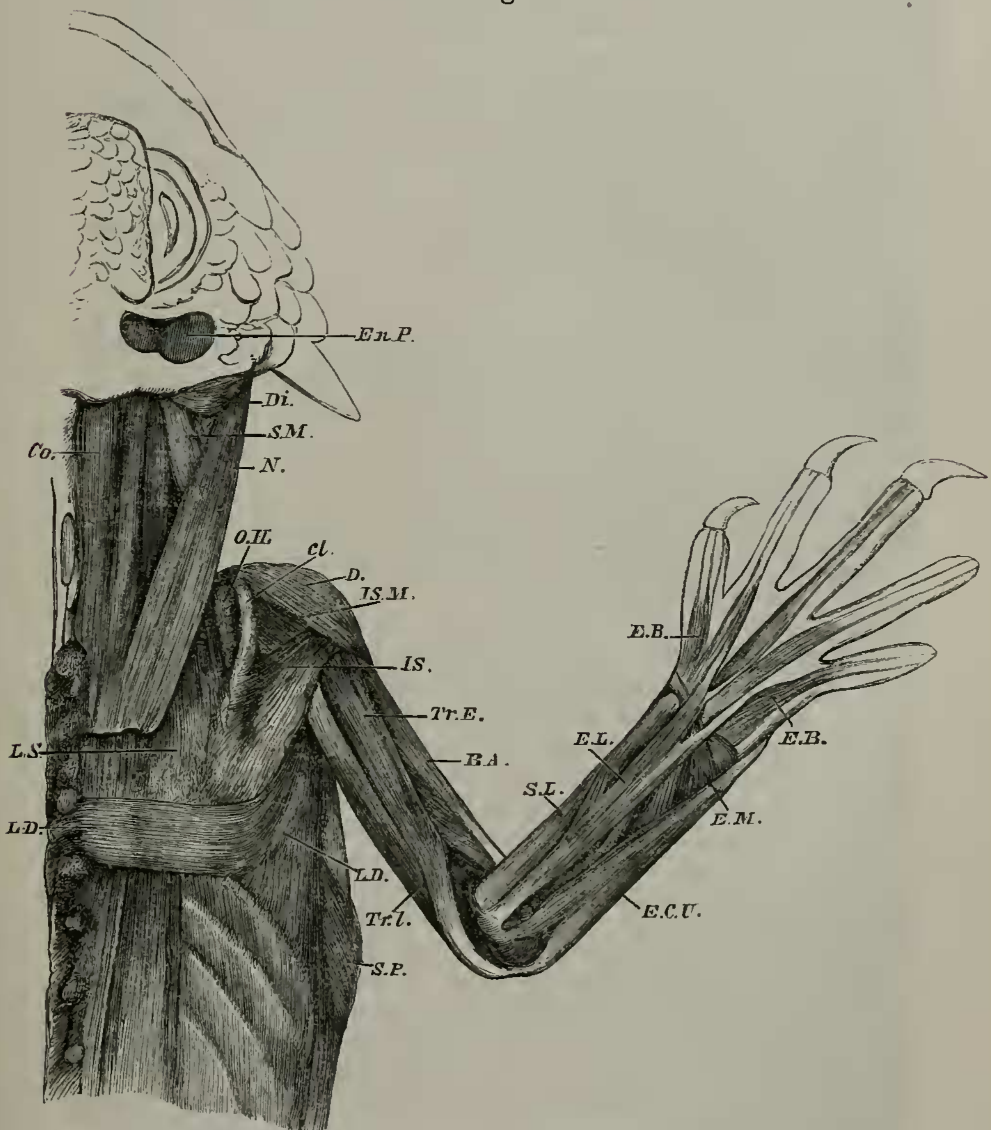
Extensor brevis digitorum (fig. 3, *E.B.*) consists of five short muscular slips which arise from the dorsal surface of the carpus; each of these slips ends in a tendon which is inserted into the terminal phalanx of its respective digit.

There are two muscles which have the attachment of pronators of the forearm. The first may be called

* *Loc. cit.* p. 416.

Pronator radii longus (fig. 1, *P.R.L.*); this arises from the inner condyle of the humerus, and passing obliquely down the arm is inserted into the distal extremity of the radius; the second,

Fig. 3.



Superficial muscles on the dorsal aspect of anterior half of the body. × 3.

Pronator radii brevis (fig. 1, *P.R.b.*): this arises from the outer side of the internal condyle covered by the last, and is inserted into the lower end of the proximal third of the radius. This latter appears to correspond to the pronator accessorius of the *Iguana tuberculata*, in which species, according to Mr. Mivart, both muscles are represented; in *L. belli* the longus only occurred; but neither were found in *P. japonicum*.

Flexor carpi ulnaris arises by two heads—one from the inner condyle in conjunction with the extensor digitorum perforans, the other from the proximal end of the ulna; this part is in intimate connexion with the extensor carpi ulnaris; the whole is inserted into the pisiform bone and into the flexor surface of the base of the metacarpal bone of the fifth digit.

Flexor carpi radialis (fig. 1, *F.C.R.*) arises from the inner condyles, also in conjunction with the flexor perforans, and is inserted into the radial side of the first digit, being closely attached to the scaphoid in its passage across the carpus.

Flexor perforatus digitorum arises, as usual, from a tendinous band across the wrist; it gives off a slip for each digit, the tendons dividing for the passage of the perforans.

Flexor perforans digitorum arises from the internal condyle and from about two thirds of the proximal end of the ulna; it forms a broad tendinous expansion in the palm, which receives a muscular slip from the ulnar side of the carpus, and then divides into five tendons, one for each digit.

The superficial muscle on the ventral aspect of the thigh does not extend so forward as the one in *L. belli* or *P. japonicum*; I therefore conclude that the first muscle in those species, viz. the sartorius, is absent from *P. coronatum*, and that the muscle met with immediately beneath the skin represents the more posterior and deeper muscle, viz. the

Gracilis (figs. 4 & 6, *G.*), which arises from a small portion of the posterior end of the ischio-pubic ligament*, from the pubic symphysis by means of a thin aponeurosis, and from the ventral angle of the ischium; it becomes more contracted in descending the thigh, and is inserted by a narrow tendon on the inner surface of the tibia not far distad of the knee-joint.

Transversus perinei (fig. 4, *Tr. P.*) is well marked in this specimen; it arises as in *L. belli*, from the cartilaginous rod which is the continuation backward of the ischio-pubic symphysis, and, forming a broad plane of muscular fibre, is inserted into the ilio-ischiatic ligament, or that ligament which extends from the ischium on the ventral surface to the posterior point of the ilium dorsad. This muscle is placed in front of the cloacal aperture; it appears to correspond to the transversus perinei in *Iguana*, but not to the muscle described under the same name in *Chamæleon*. Behind it are several small muscles devoted to the office of opening or closing this orifice; of these the

Dilatator cloacæ (fig. 4, *D.C.*) arises from the connective tissue beneath the hypapophyses of the 5th and 6th caudal vertebræ; and passing forward in the central line, it divides into two branches, like the letter Y, which are inserted, one on each side of the cloacal aperture, into the connective tissue of its posterior lip.

* Which is the tendinous band extending from the hamular process of the pubis to the ischium.

Sphincter cloacæ (fig. 4, *Sp. C.*).—The fold of skin which forms the posterior boundary of the cloacal aperture encloses a muscular band, which appears to perform the function of a sphincter, although it is not homologous with the sphincter ani; it arises from the ilio-ischiatic ligament behind the transversus perinei, and then passes behind the cloaca to be inserted on the opposite side in the same manner and at the corresponding place.

Retractor cloacæ (fig. 4, *R.C.*) arises by two origins from the transverse processes of the sixth and seventh caudal vertebræ, which pass forward and unite together into one muscular fasciculus, the superficial fibres of which are inserted into the posterior border of the last a short distance on the outside of the mid line, while its deeper fibres pass beneath to be inserted into the outer edge of the cloaca; some of the fibres also spread out over the anterior margin of the same.

Constrictor cloacæ (fig. 4, *C.C.*) arises from the transverse process of the third caudal vertebra, and is inserted near the apex of the cartilaginous rod which is attached to the posterior end of the symphysis ischii, above the posterior part of the origin of the transversus perinei; its fibres are attached to the side of the cloaca in their course, so that they are capable of constricting it.

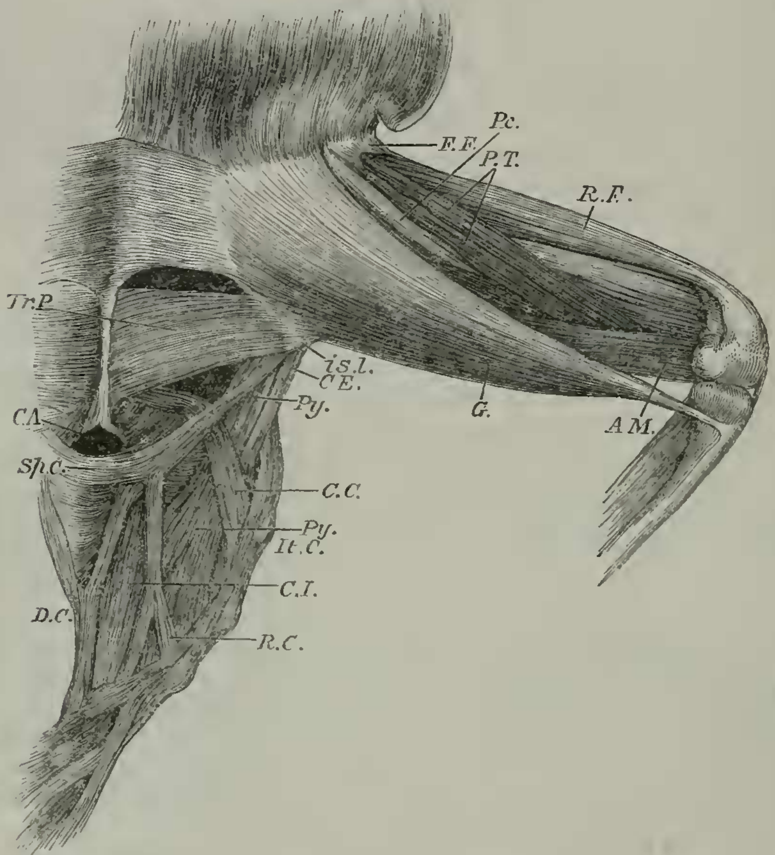
Intertransversalis caudæ (figs. 4 & 5, *It. C.*) is a muscle which runs along the extremities of the transverse processes of the six anterior caudal vertebræ; posteriorly it blends with the ordinary caudal muscles; anteriorly it unites with the under surface of the sacro-lumbalis, and is attached to the posterior end of the ilium.

Adductor magnus (fig. 4, *A.M.*) arises by a flat tendon from the ilio-ischiatic ligament beneath the origin of the gracilis, and is inserted fleshy into the internal condyle of the femur and into the interarticular cartilage of the knee-joint. No muscle corresponding to this was found in either *P. japonicum* or *Liolepis belli*: neither is it mentioned by Mr. Mivart as occurring in *Iguana*. There appears to be a muscle somewhat like it in *Chamæleon*; but, from the description, I should imagine that it does not extend so far as the condyles.

Pectineus (fig. 4, *Pc.*) arises from a point of the ischium behind and internal to the acetabulum, and from the deep surface of the aponeurosis which covers the lower surface of the pubis and ischium. Its origin is a broad expanse of muscular fibre; it is inserted into the ventral surface of the femur, occupying one fourth of its length on the proximal side of the central point. I am uncertain whether to call this pectineus or an adductor; the point in favour of its being pectineus is, that its insertion is more towards the ventral surface than would be the case if it corresponded to an adductor.

Pelvo-tibialis (fig. 4, *P.T.*) may be described as arising by two heads, one from the anterior division of the flexor femoris, the other from the outer and anterior edge of the pubis, in front and rather to the inside of the origin of the rectus femoris; each head is an elongated narrow muscular ribbon, which proceeds down the thigh; the two joining together form a short tendon, which penetrates the knee-joint and is attached to the tendon of the semimembranosus, which is inserted into the outer edge of the tibia between it and the fibula. This muscle therefore resembles the corresponding one of *L. belli* in having two heads and being inserted into the tibia, but differs in the two heads being closer together, in the tendon passing through the

Fig. 4.



Superficial muscles on the ventral aspect of the posterior extremity. × 3.

joint, and in joining the semimembranosus; it differs from the same muscle in *P. japonicum* by being double and joining the semimembranosus, but resembles it in passing through the joint. Mr. Mivart has figured this muscle both in *Iguana* and *Chamæleon* under the name of tibial adductor.

Pyriformis (fig. 4, *Py.*) resembles the same muscle in *L. belli* and *P. japonicum* in general appearance, but differs slightly in origin, inasmuch as it is not attached to the centre of the caudal vertebræ, but only to the inner end of the under surface of the transverse processes of the sixth to the first inclusive; it passes as usual through the pulley formed by the ilio-ischiatic ligament, and is inserted into the femur at the posterior border of the pectineus. The tendon, which passes down the thigh, is inserted into the interarticular cartilage of the knee-joint, and does not join any muscle of the leg, as it does in *L. belli*, where this tendon, after joining that of the gastrocnemius, is inserted into the back part of the head of the fibula. In that memoir * I was induced to consider this muscle homologous with the pyriformis by reason of its general aspect. It arises from the under surface of the caudal vertebræ, a surface which is continuous with the under surface of the sacrum †; its tendon passes out of the pelvis over a pulley, as it were, formed by a ligament which goes from the posterior end of the ilium to the outer and posterior angle of the ischium, and which I have ventured to name the ilio-ischiatic ligament. Now this ligament appears to occupy the position of the greater sacro-ischiatic ligament in the human subject. These facts give this muscle quite the facies of a pyriformis. Meckel was so struck with this resemblance that he remarked that it "entspricht dem birnförmigen Muskel des Menschen" ‡. It corresponds to the muscle termed femoro-caudal § by Mr. Mivart in the *Iguana* and *Chamæleon*; the muscle termed pyriformis in the former appears to be partly represented in my specimen by a muscle which I have termed coccygeus externus. As a figure of the pyriformis was given in my memoir on *L. belli*, I did not consider it necessary to repeat it.

Coccygeus externus (figs. 4 & 5, *C.E.*) arises from the lower edge of the outer extremity of the transverse processes of the first and second caudal vertebræ, and is inserted into the ilio-ischiatic ligament at a point corresponding to the origin of the semitendinosus and behind the quadratus femoris.

Coccygeus inferior (fig. 4, *C.I.*) or internus (ischio-caudal in *Chamæleon*) resembles that muscle in *L. belli* in every thing except that it arises only from the fifth and sixth caudal vertebræ instead of from the tenth to the third.

Iliacus arises from the lower surface of the symphysis ischii and from the inner end of the same aspect of the pubis; the fibres converge and are inserted into the summit of the trochanter of the femur. It resembles the same muscle in *L. belli*, and corresponds to the second and third part of the pectineus as figured in Mr. Mivart's paper on the *Iguana*. My reasons for considering this to be homologous with the iliacus in anthropotomy are as follows:—In the first place the insertions agree; for it appears to me that there can be no doubt that the trochanter of the femur in lizards is the tibial trochanter, and therefore corresponds with the trochanter minor in human anatomy. Secondly, although the fibres are not derived from the right bone, they face as it were the right direction, viz. towards the ventral surface of the body. That the muscles termed

* *Loc. cit.* p. 173.

† In the *Tropidolepisma* referred to above, I found that the anterior fibres of this muscle actually arise from the under surface of the second vertebra of the sacrum.

‡ Vergleichende Anatomie, Theil iii. pp. 152, 153.

§ The Rev. Prof. Haughton has described this muscle in the Crocodile, under the name m. extensor femoris caudalis, Ann. Nat. Hist. 1868; it is also mentioned by Dr. Günther in his memoir on the lizard *Hatteria*, in Trans. Roy. Soc. 1867.

iliacus in *Iguana* are wrongly so interpreted will appear upon the consideration that they are situated on the outer side of the limb instead of the lower or ventral side, and that the fibres face dorsad instead of ventrad. As the latter muscle arises from the same bone as the iliacus in my specimen, that point need not be discussed.

Iliacus externus is simply a dismemberment of the iliacus, but has a distinct origin and insertion; it arises from the whole length of the posterior edge of the pubis, and is inserted into the front part of the trochanter beyond the iliacus and extending between it and the insertion of the pyriformis. It differs from the same muscle in *L. belli* only in not being connected with the origin of the pelvo-tibialis; it corresponds with pectineus No. 1 in *Iguana*.

Obturator externus arises from the ventral or lower surface of the ischium, extending from the mid line as far outward as the external angle of the same, and is inserted into the posterior and outer surface of the femur, behind the trochanter and close to the head. This nearly resembles the same muscle in *L. belli*, except that it does not cover the ischio-pubic foramen. This is figured in my paper on *L. belli*, and also in fig. 17 of Mr. Mivart's paper on *Iguana*.

The muscles on the dorsal or upper aspect of the ischium and pubis are not so complicated as in *L. belli*; neither are they connected in so intimate a manner; instead of four there are only two muscles in this species, the flexor femoris and flexor tibialis not being represented, or rather one muscle combining the properties of the two; it may therefore retain the name of

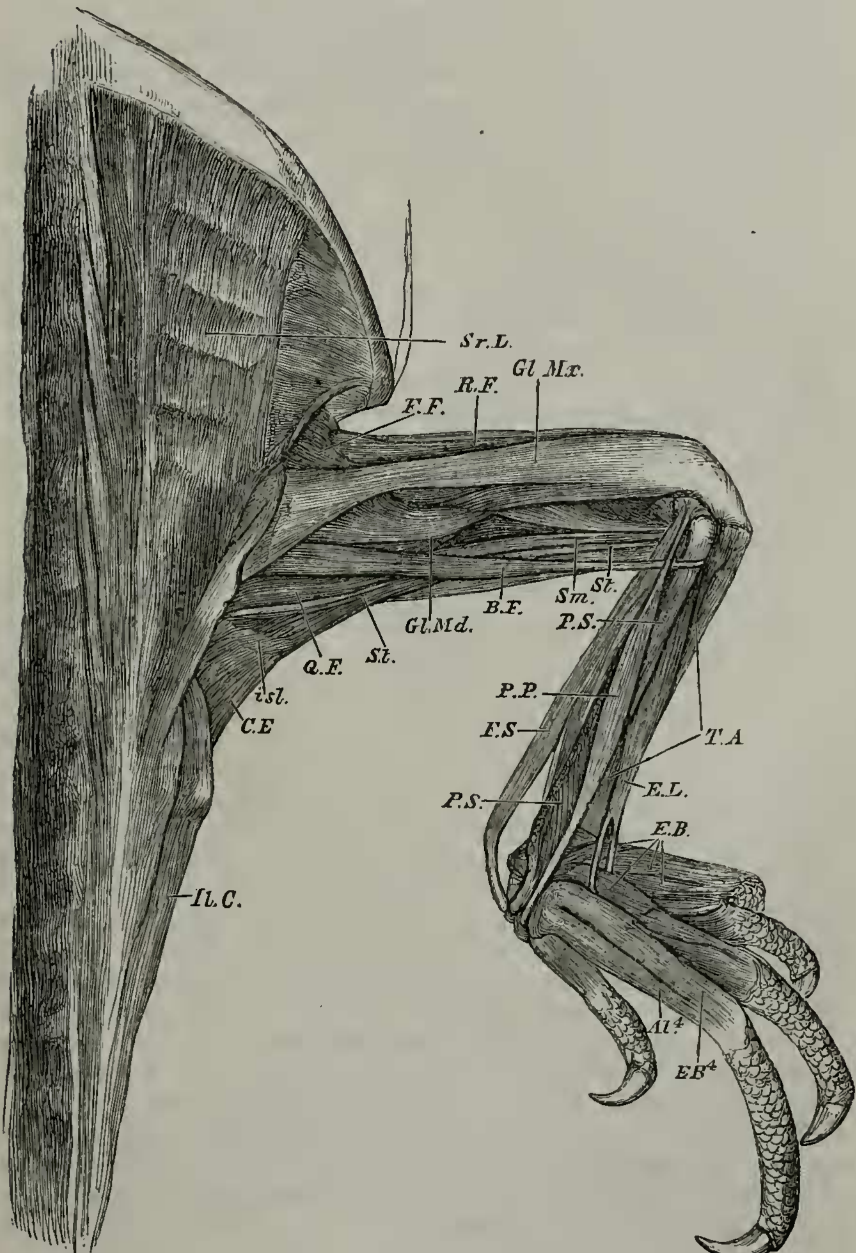
Flexor femoris (figs. 4 & 5, *F.F.*). This arises from the inner half of the dorsal surface of the pubis, and from the external half of its ventral surface and also from its anterior edge. The part from the anterior edge becomes merged into the pelvo-tibialis; while the posterior portion is inserted into the anterior and inner surface of the femur close to the head of that bone, passing behind the origin of the rectus and in front of the vastus externus; this corresponds to the second section of the iliacus in *Iguana*. A muscle figured in my paper on *L. belli*, and there termed flexor tibialis, appears to correspond to the first part of the iliacus in *Iguana*.

Obturator internus arises from the dorsal surface of the whole length of the ischium and from the posterior two thirds of the ischio-pubic ligament; it passes out of the pelvis behind the last, and ends in a narrow tendon which is inserted into the posterior surface of the femur a short distance from the head; this corresponds to the third portion of the iliacus in *Iguana*, while a muscle not found in this specimen, but figured in *L. belli* under the name of flexor profundus femoris, appears to be the same as the fourth section of the iliacus in *Iguana*.

Rectus femoris (figs. 4 & 5, *R.F.*) in this species has only one origin, from the edge of the pubis in front of the acetabulum; it ends in the usual manner to coalesce with the two vasti to form the quadriceps or, rather, in this case, the triceps extensor femoris, and is inserted by means of the ligamentum patellæ into the head of the tibia.

Vastus externus commences in a point close to the head, covering the tendon of the obturator internus. The vastus internus is, as usual, much the smaller, and occupies only the distal half of the femur; the

Fig. 5.



Superficial muscles on the dorsal aspect of the posterior extremity. × 3.

externus is situated more anteriorly, and the internus more posteriorly. The crureus cannot be separated as a distinct muscle.

Gluteus maximus (fig. 5, *Gl. Mx.*) is more distinct from the rectus than in *L. belli*, and still more so than in *P. japonicum*. It arises from the whole length of the posterior apophysis of the ilium, and joins the vastus externus at about the centre of the thigh. This is the same as gluteus maximus in *Iguana*, but not in the Chameleon.

Biceps femoris (fig. 5, *B.F.*) arises from near the posterior end of the posterior apophysis of the ilium by means of a narrow tendon, and, passing down the thigh, is inserted into the outer side of the fibula a short distance beyond the head of the bone; its tendon is crossed by that of the peronæus; this corresponds to the ilio-peroneal in *Iguana*.

Semimembranosus (figs. 5 & 6, *Sm.*) arises fleshy from the postero-external angle of the ischium and from the ventral end of the ilio-ischiatic ligament; its belly forms an elongated cone, which becomes at the distal half of the thigh a long thin tendon, which receives the tendon of the pelvo-tibialis, and is inserted into the outer edge of the head of the tibia, passing through the knee-joint on its way. In this species the semimembranosus of *L. belli* and the principal section of that muscle in *P. japonicum* appear to be absent; but this muscle would seem to represent that section of the semimembranosus which in *P. japonicum* was inserted between the tibia and fibula, close to the insertion of the pelvo-tibialis, and corresponds to the second portion of the semimembranosus in *Iguana*.

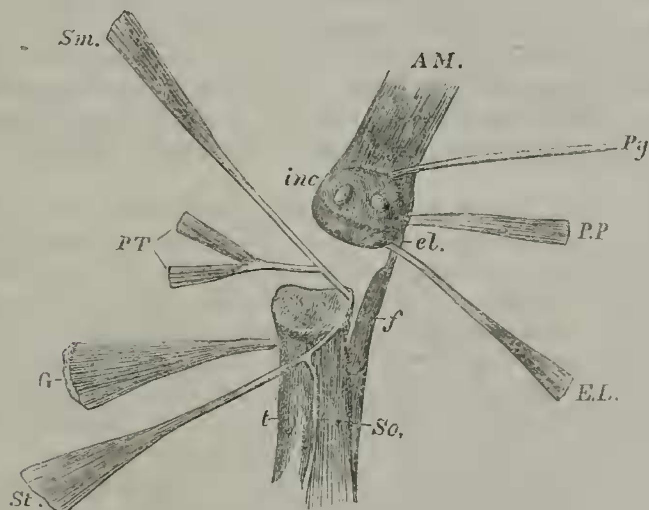
Semitendinosus (figs. 5 & 6, *St.*) arises immediately behind the last, from the posterior part of the ilio-ischiatic ligament, extending nearly as far as the posterior end of the ilium. It ends in a long thin tendon, which is inserted into the external edge of the head of the tibia close to the insertion of the pelvo-tibialis; it also gives off two supplementary tendons, one of which goes to the inner side of the tibia, close to the insertion of the gracilis, the other goes down the leg along the inner edge of the soleus; this clearly corresponds to the biceps in *Iguana*. I am still of opinion that the interpretation of these three muscles is in the main correct. With regard to their origins they maintain the relations found in the human subject (semimembranosus arising ventrad of the others) both in the present specimen and in *L. belli* and *P. japonicum*, where, moreover, the two latter muscles are inserted into the inner side of the head of the tibia. With regard to the ilio-peroneal, both its origin and insertion appear to me to agree very well with those points in the biceps; and Prof. Rolleston in the memoir above referred to remarks that "this muscle is clearly one of the series made up of the biceps &c.," which opinion might perhaps justify me in adhering to my former interpretation.

Gluteus medius (fig. 5, *Gl. Md.*) arises fleshy from the outer side of the anterior two thirds of the ilium, covered by the gluteus maximus, and is inserted into the outer and posterior side of the femur for nearly half its extent beyond the head and behind the origin of the vastus externus.

Quadratus femoris (fig. 5, *Q.F.*) arises from the posterior point of the ilium behind the biceps femoris and in front of the semitendinosus; it is inserted into the proximal end of the femur dorsad of the insertion of the pyriformis.

Soleus (fig. 6, *So.*), the most superficial muscle on the back of the leg, arises from the posterior surface of the head of the tibia; the semitendinosus is inserted close to its origin, and gives off a tendon which borders its inner edge. The muscle in question terminates in a broad thin membranous tendon which is lost over the tarsus, but is more particularly attached to the cuboid and outer side of the metatarsal bone of the fifth digit; this appears to be the tibial head of the soleus, the gastrocnemius not being represented. This muscle

Fig. 6.



Arrangement of the tendons surrounding the knee-joint. × 3.

is not present in *L. belli*, but is met with in *P. japonicum*, where it was named extensor tarsi, and where its origin accords more with one head of the soleus of anthropotomy in arising from the middle of the shaft instead of from the head of the tibia.

Flexor perforatus digitorum (fig. 5, *F.S.*) arises from the outer condyle of the femur. It ends in two bellies, one of which joins the deep flexor; the other expands into a broad tendon, which is attached on one side of the tarsus to the cuboid, and on the other to the tibial side of the astragalo-calcaneus. From this broad tendon two muscles continue on to the sole: these are perforated for the passage of the perforans tendon, one being inserted on each side of the base of the first phalanx of the first digit, the other on each side of the base of the first phalanx of the second digit. The third digit also has a perforatus; but this arises independently from the cuboid, and is inserted like the other two: the fourth and the fifth digits have no perforatus.

Peronæus primus (fig. 5, *P.P.*), like that of *L. belli*, arises from the external condyle of the femur by a flat but narrow tendon, expands in the leg into an elongated muscular mass, and terminates in a long thin tendon which is inserted into the cuboid.

Peronæus secundus (fig. 5, *P.S.*) arises from the distal four fifths of the fibula, and is inserted into the posterior edge of the cuboid.

Flexor perforans digitorum arises from rather less than the proximal fourth of the fibula; it receives a muscular slip from the perforatus, and terminates in a broad tendon in the sole, which, passing over the tarsus, receives a musculo-tendinous slip from the tibialis posticus; the tendon for the fifth digit is given off first as usual, in this case opposite the proximal end of the cuboid; four other tendons subsequently arise, which are inserted into the distal phalanx of their respective digits. A muscular slip arises from the cuboid to be inserted into the fibular side of the broad part of the tendon. Four muscular slips, which together form a *Flexor accessorius*, arise from this part of the tendon; that for the fourth digit, from the superficial surface, ends in a long tendon inserted into the third phalanx of that digit; the three others are derived from the deep surface, and are inserted respectively into the base of the first phalanx of the second, third, and fourth digits.

Tibialis posticus resembles the muscle of that name in *L. belli.*

Extensor longus digitorum (fig. 5, *E.L.*) arises as usual from the front part of the external condyle of the femur by a tendon which passes through a groove formed by the head of the fibula and that of the tibia; it terminates by two tendons, which are inserted, one into the fibular side of the base of the third, and the other into the corresponding side of the fourth metatarsal bone.

Tibialis anticus (fig. 5, *T.A.*) resembles that muscle in *L. belli,* except that it has no supplementary tendon.

Extensor brevis digitorum (fig. 5, *E.B.*) resembles the same muscle in *L. belli,* but is not so complicated. It arises from the cuboid, and gives a slip to each of the digits from the first to the third; the fourth has an extensor muscle to itself, which, together with an abductor for the same digit, arises from the cuboid.

In the sole there is an adductor digitorum, consisting of three slips, which, crossing the sole obliquely, are inserted respectively into the base of the first phalanx of the hallux and the second and third digits. There are also three palmar interossei, but no appearance of lumbricales.

LIST OF EXPLANATORY LETTERS USED IN THE WOODCUTS.

They are the same in all.

A.M. Adductor magnus.
B.A. Brachialis anticus.
B.F. Biceps femoris.
C.B.l. Coraco-brachialis longus.
C.B.br. Coraco-brachialis brevis.
C.C. Constrictor cloacæ.
C.E. Coccygeus externus.
C.I. Coccygeus internus.
D. Deltoid.
D.C. Dilatator cloacæ.
E.B. Extensor brevis digitorum.
E.C.U. Extensor carpi ulnaris.
E.L. Extensor longus digitorum.
E.M. Extensor metacarpi pollicis.
En.P. Entopterygoid.
F.C.R. Flexor carpi radialis.
F.F. Flexor femoris.
F.S. Flexor perforatus or sublimis.
G. Gracilis.
G.H. Genio-hyoglossus.
Gl.Md. Gluteus medius.
Gl.Mx. Gluteus maximus.
H.G. Hyoglossus.
in.c. Interarticular cartilage of knee-joint.

i.p. Ischio-pubic ligament.
I.S. Infraspinatus.
i.s.l. Ilio-ischiatic ligament.
It.C. Intertransversalis caudæ.
L.D. Latissimus dorsi.
L.S. Levator scapulæ.
N. Neuro-mandibularis.
O.H. Omohyoid.
P. Pectoralis major.
Pc. Pectineus.
P.M. Platysma myoides.
P.P. Peronæus primus.
P.R.b. Pronator radii brevis.
P.R.l. Pronator radii longus.
P.S. Peronæus secundus.
P.T. Pelvo-tibialis.
Py. Pyriformis.
Q.F. Quadratus femoris.
R.C. Retractor cloacæ.
R.F. Rectus femoris.
S. Subscapularis.
S.A.[1] & [2] Serrati.
S.C.e. Sterno-coracoidalis externus.
S.H. Sternohyoideus.
S.H.[1] Sternohyoideus profundus.
S.L. Supinator longus.
S.M. Sterno-mastoid.
Sm. Semimembranosus.
So. Soleus.
S.P. Serratus posticus.
Sp.C. Sphincter cloacæ.
S.S. Supraspinatus.
St. Semitendinosus.
T.A. Tibialis anticus.
Tr.e. Triceps external head.
Tr.i. Triceps internal head.
Tr.l. Triceps long head.
Ts.M. Teres minor.
Tr.P. Transversus perinei.

January 20, 1874.

Prof. Newton, F.R.S., V.P., in the Chair.

Mr. Sclater exhibited two skulls of Baird's Tapir (*Tapirus bairdi*) which had been forwarded to him by Mr. Constantine Rickards of Oaxaca, Mexico, as obtained in that district, and which he had deposited in the Museum of the Royal College of Surgeons.

In one of them (2932 E of Mus. Cat.), in which the last molar teeth were not yet in place, the nasal septum characteristic of this Tapir was manifest, although not completely ossified; in the other the nasal bones and septum were unfortunately imperfect.

It appeared therefore certain that Baird's Tapir extended from Panama through Central America into Southern Mexico, and was probably the only species of this genus to be met with north of the Isthmus of Panama*.

Mr. Sclater also exhibited the horns of a male and female Arkar Sheep (*Ovis arkar*) transmitted to the Society by General Poltarski, Military Governor of Semipalatinsk. They were those of animals killed (the male in the winter of 1871 in the Altai, and the female in the autumn of 1872) about 60 versts from Semipalatinsk. General Poltarski had transmitted the skins of these fine sheep as well; but these had not arrived in a good state of preservation.

Mr. Sclater also exhibited the stuffed skin of one of two specimens of the Wild Ibex of Crete, presented to the Menagerie by Mr. Thomas B. Sandwith, H.B.M. Consul, May 21, 1873. In an article published in the Society's 'Proceedings' for 1872 (p. 689) and elsewhere,

* See previous remarks on this subject, P. Z. S. 1867, p. 473.

this species had been called *Capra picta*, Erhardt*. But there seemed to be little doubt, upon further examination, that the Wild Goat of Crete and the Cyclades, known since the days of the Odyssey†, was not really separable from *Capra ægagrus* (Pallas) of Western Asia. Mr. Busk had kindly examined the skull of the present specimen, and quite agreed with this identification. Blasius ('Säugeth. Europas,' p. 483) had spoken of the Wild Goat of Crete and the Cyclades as *Capra beden*, but without giving any authority for this statement.

Mr. Sandwith had furnished the following note on the occurrence of *Capra ægagrus* in Crete:—

"The Cretan Ibex is found on the slopes of Mount Ida and on the White Mountains, both of which attain a height of 8000 feet.

"Living amidst inaccessible rocks at an elevation of 4000 feet and upwards, they are seldom molested, being only occasionally shot by shepherds; and the island being free from beasts of prey, man is the only enemy they have to fear. The female sent to the Society's Gardens was procured from the White Mountains when a few weeks old; the two males were from Mount Ida, also taken when quite young. At first they were very wild, but soon grew tame, being fed chiefly on mulberry-leaves, and afterwards on barley and oats.

"Two of these animals have recently been sent to Berlin."

Mr. Edwin Ward, F.Z.S., exhibited two double hind feet of a Fallow Deer (*Cervus dama*), and read the following remarks:—

"Amongst a herd of about 150 Fallow Deer belonging to Lady Churchill, of Cornbury Park, Oxon, there has existed a doe possessing a malformation consisting of double hind feet.

"This doe has for several successive years dropped a fawn with the same malformation of double hind feet as her own.

"The keepers state that the doe had been served by different bucks each year. The hind feet of her progeny never differed, but always partook of the shape of the mother's.

"The division occurs in the upper part of the tarsus, which gradually diverges into two separate tarsi and two separate feet."

The following papers were read:—

1. On an apparently new Species of Parrot from Eastern Peru. By Otto Finsch, Ph.D., C.M.Z.S., &c., Curator to the Bremen Museum.

[Received November 29, 1873.]

Psittacula andicola, sp. nov.

Diagn. *Viridis unicolor, subtus dilutior; mento olivaceo-flavido; rostro canescenti-corneo.*

Description.—Upper parts beautiful dark grass-green, rump and upper tail-coverts somewhat brighter; the feathers on the occiput

* See Rev. Cat. Vert. p. 90. † See Odyssey, ix. 118 and 154.